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Original Article

## Fatty acid, amino acid and trace mineral analysis of three complementary foods from Jos, Nigeria<sup>☆</sup>

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### Abstract

Complementary foods (CF), commonly known as weaning foods, are semi-solid or solid foods that are used to transition infants from breast milk to an adult diet. Their nutritional content is important to the growth and development of children, particularly in developing countries such as Nigeria. In a previous study five CF produced in Jos, Nigeria were analyzed for their nutritional content. Based on those findings, three new CF were formulated in an effort to improve the nutritive value. The new formulations (second-generation CF) were analyzed for fatty acid (FA), amino acid, and mineral and trace element content. The results were compared to those of the most nutritious CF previously analyzed (designated Soy). The total FA content of all three second-generation CF (3.89–20.8 mg/g) was lower than the first-generation Soy

*Abbreviations:* ABR, acha, bambara nut, rice; AI, adequate intake; ATC, aya, tamba, carrots; CF, complementary foods; DHA, docosahexaenoic acid; DRI, dietary reference intakes; EAR, estimated average requirement; EFA, essential fatty acids; FA, fatty acid(s); JUTH, Jos University Teaching Hospital; MMSG, maize, millet, sorghum, groundnuts; RDA, recommended dietary allowances; UL, tolerable upper intake level; WF, weaning food(s); WHO, World Health Organization.

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mixture (105 mg/g). The content of linoleic and  $\alpha$ -linolenic acids among the second-generation CF (1.64–10.1 and 0.084–0.63 mg/g, respectively) was also lower than the Soy CF (59.7 and 7.46 mg/g). The second-generation CF all had higher iron content than Soy (138–288 versus 98.1  $\mu$ g/g). The amounts of magnesium (1030–1733 versus 2255  $\mu$ g/g), phosphorus (2237–3830 versus 5685  $\mu$ g/g), and zinc (28.9–37.9 versus 54.8  $\mu$ g/g) in the second-generation CF were lower than in Soy. The second-generation CF also had lower protein content than Soy (66–197 versus 355 mg/g). Overall, the new second-generation CF had a lower nutritive content than the original Soy CF.

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*Keywords:* Amino acids; Complementary food; Essential fatty acids; Infant nutrition; Nigeria; Trace minerals

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## 1. Introduction

During the first 6 months of life, breast milk is the preferred nutrient source for the infant since it contains easily digestible fatty acids and proteins for growth, while also providing protection against disease, especially diarrhea (Werk and Alpert, 1998; Hautvast et al., 1999). Breastfeeding not only decreases an infant's susceptibility to gastrointestinal disease, but also frees the family from the financial burden of buying formula milk and reduces a mother's risk of breast cancer (Werk and Alpert, 1998). However, after 6 months of age, the energy and nutrient requirements of the infant exceed what can be supplied by breast milk alone (Werk and Alpert, 1998).

In Nigeria, as in most other sub-Saharan countries, breastfeeding is practiced by nearly all women in both rural and urban areas (Bentley et al., 1991; Jansen, 1992). In that part of the world, complementary feeding is usually begun between 3 and 6 months of age, but the length of time a mother will breastfeed has been shown to vary from 1 to 2 years depending on socio-economic factors (Jansen, 1992). Complementary foods (CF), also known as weaning foods (WF), are semi-solid or solid foods that are introduced to the diet of a breast- or formula-fed infant during the transition to an adult diet. They are also used as an easily digestible supplemental source of nutrients for children or adults, especially during recovery from disease.

The recommendations for complementary feeding from the American Academy of Pediatrics include exclusive breastfeeding for the first 4–6 months of age, introduction of solid foods at 4–6 months of age, and continued breastfeeding to the first birthday and beyond if possible (Kleinman, 1998). The World Health Organization (WHO) recommends exclusive breastfeeding for 6 months, with introduction of CF and continued breastfeeding thereafter (World Health Organization/Food and Health Organization, 1995).

The timely introduction of properly formulated and prepared CF is necessary for the growth and survival of infants, especially in the developing world (Jansen, 1992). In Nigeria, the introduction of CF usually involves use of a semi-liquid porridge prepared locally by the mother from staple cereals or tubers (Bentley et al., 1991; Nout, 1993; Gupta, Esrey, Oni, & Brown, 1993). Legumes such as soybeans, bambara nut and groundnut are often used to complement the high cereal content. However, traditional CFs rarely fulfill the nutritional needs of the African infant. The low energy and low nutrient density, stiff consistency and high volume of homemade porridges combine to offer a filling meal at low cost, but one that usually lacks adequate nutritive value.

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